

AGU Fall Meeting 2011
San Francisco, CA 5-9 December 2011

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TITLE: SIERRA-Flux: measuring regional surface fluxes of carbon dioxide, methane, and water vapor from an unmanned aircraft system

SESSION TYPE: Oral

SESSION TITLE: B14A. Advances in Environmental Sensing Technologies to Study Ecosystem Structure, Functioning and Services II

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ABSTRACT BODY: The Eddy-Covariance Method for quantifying surface-atmosphere fluxes is a foundational technique for measuring net ecosystem exchange and validating regional-to-global carbon cycle models. While towers or ships are the more frequent platform for measuring surface-atmosphere exchange, experiments using aircraft for flux measurements have yielded contributions to several large-scale studies including BOREAS, SMACEX, RECAP by providing local-to-regional coverage beyond towers. The low-altitude flight requirements make airborne flux measurements particularly dangerous and well suited for unmanned aircraft. In a series of flights in June of 2011, the NASA SIERRA carried a payload consisting of the NASA Ames Meteorological Measurement System (MMS) and a fast response (10Hz) CO₂, CH₄, and H₂O vapor analyzer in order to demonstrate the feasibility of measuring fluxes from unmanned aircraft and to characterize accuracy and precision based upon ground measurements. The flights were conducted in Railroad Valley, NV in order to provide a simple model for understanding biases and uncertainties. This paper describes the system specifications, provides preliminary data compared against coincident ground measurements, and discusses future applications of the system.